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An apparatus for stripping electrolytically deposited metal from a cathode

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ABSTRACT

The inventive stripping apparatus (6) comprises a carriage (10) mounted for translational movement in frame (11). The carriage (10) is provided with lugs (12) which project through opening (13) in the frame (11). Lugs (12) are connected to lifting means (16) positioned on either side of the frame (11). The carriage (10) may be raised or lowered relative to frame (11) by means of lifting means (16) which are preferably pneumatic or hydraulic rams.

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

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Invention Title: "AN APPARATUS FOR STRIPPING ELECTROLYTICALLY DEPOSITED METAL FROM A CATHODE"

Details of Associated Provisional Application No. PN9285 dated 15th April, 1996

The following statement is a full description of this invention, including the best method of performing it known to us:-

This invention relates to an apparatus for stripping electrolytically deposited metal from a cathode plate.

In the process of electrolytic refining or electrowinning pure metals such as copper, zinc or nickel, is deposited from solution onto a permanent reusable cathode plate, the metal is stripped from the cathode plate by mechanical means and the cathode plate is reused to deposit further amounts of metal.

In large capacity plants, automatic stripping machines are used to loosen the deposit, strip the deposit from the cathode plate and stack the stripped sheets. These operations are conducted in separate stations requiring transfer of the cathode plate to each station such as by a conveyor or a carousel. Such methods are capital intensive.

In small capacity plants, the stripping operation is carried out manually.

It would be desirable to provide an apparatus which is capable of enabling the loosening and stripping operation to be conducted in the same device.

According to a first aspect of the invention there is provided an apparatus for stripping electrolytically deposited metal from a cathode plate comprising:

a frame having upper and lower support members for supporting the cathode plate about upper and lower edge portions thereof;

a carriage member mounted for translation relative to the frame, the carriage member being provided with flexing means for flexing the cathode plate in a direction substantially perpendicular to the plane of the frame to thereby loosen the metal from the cathode plate;

means for raising and lowering the carriage member relative to the support members; and

means associated with the carriage for engaging the loosened metal to strip the metal from the plate when the carriage is lowered relative to the support members.

According to a second aspect of the invention there is provided a method of stripping an electrolytically deposited metal from a cathode plate said method comprising the steps of:

substantially vertically positioning the cathode plate with deposited metal thereon and supporting said plate at upper and lower edge portions thereof;

flexing at least a portion of said cathode plate in a direction substantially perpendicular to the plane of undeflected plate while maintaining upper and lower edge portions of the plate in said plane of symmetry, to thereby loosen the deposited metal from the plate; and

stripping the loosened metal from the plate.

Unless the context clearly requires otherwise, throughout the description and the claims, the words 'comprise', 'comprising', and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a schematic view of an apparatus including a stripping apparatus in accordance with the present invention;

Figure 2 shows a view of a stripping apparatus in accordance with the invention;

Figure 3 is a front elevation view of the apparatus of Figure 2;

Figure 4 is a top view of the apparatus of Figure 2;

Figure 5 is a side elevation view of the apparatus of Figure 2;

Figure 6 shows the apparatus of Figure 2 in use and in the rest position with a cathode in place;

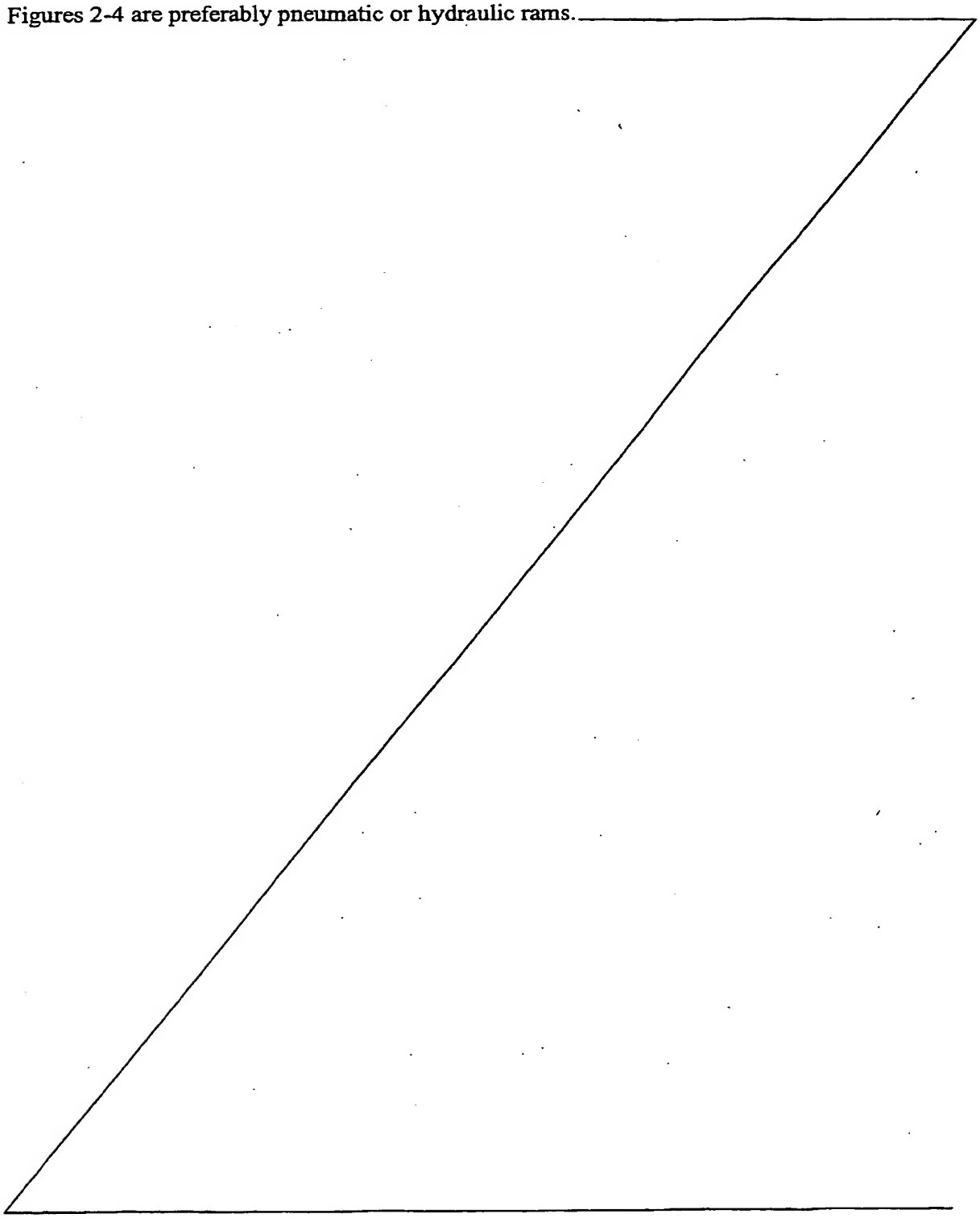
Figure 7 shows the apparatus of Figure 2 in use and in the up position ready to begin the stripping operation; and

Figure 8 shows the apparatus part way down the down stroke.

Turning firstly to Figure 1, racks of cathodes (permanent cathode plates 1 together with deposited metal cathodes 2 on either side - see Figure 2) are fed by means of a conveyor 3 to a wash chamber 4 where the cathodes are washed. The cathodes are then fed individually by the conveyor 3 to a pivot arm hoist which picks up a plate by means of its hanger bar and transports it to a stripping apparatus 6 in accordance with the invention. In the stripping apparatus 6, the deposited metal cathodes 2 are stripped from the permanent cathode plate 1. The metal cathodes 2 are then fed by a conveyor 7 to a stacking frame 8. The cathode plate 1 is then transported to a discharge conveyor 9 where it is returned back to the electrolytic cells for further deposition of metal. The pivot arm hoist 5 then picks up the next plate from conveyor 3 and the process is repeated.

The inventive stripping apparatus 6 as shown in Figures 2-8 comprises a carriage 10 mounted for translational movement in frame 11. The carriage 10 is provided with lugs 12 which project through opening 13 in the frame 11. Lugs 12 are connected to

lifting means 16 positioned on either side of the frame 11. The carriage 10 may be raised or lowered relative to frame 11 by means of lifting means 16 which, as shown in Figures 2-4 are preferably pneumatic or hydraulic rams.



The frame 11 further includes upper and lower guide members 14, 15. The upper guide members 14 are positioned to cradle the hanging bar of the cathode plate 1. Lower support member 15 supports and holds the cathode plate 1 approximately in the plane of symmetry of the frame. Since the upper and lower support members 14, 15 are connected to the frame, the carriage member is also able to be raised relative to the upper and lower support members 14.

The carriage means 10 is provided with flexing means 20. Preferably this flexing means 20, as shown in Figure 5, is provided on both sides of the carriage means. This flexing means 20 is adapted to flex the cathode plate in the direction substantially perpendicular to the plane of the undeformed cathode plate. In other words, as shown in Figure 5 flex means 20 may deform the cathode plate 1 to the left or right of the drawing.

The carriage 10 is also provided with reaction members 17, 18 at upper and lower portions of the carriage member respectively. These reaction members extend across the width of the carriage, as shown in Figure 2, and act to support the cathode plate during the flexing operation.

Knives 21 are also provided on the carriage 10 for removal of the metal on the cathode plate, as will be explained hereafter. These knives are preferably positioned in an upper portion of the carriage 10 and are biased toward to the cathode plate 1 for example by means of springs (not shown).

With further reference to Figures 1 and 6-8 the operation of the inventive apparatus will now be explained.

As shown in Figure 5, in use the pivot arm hoist 5 carries the cathode plate 1, including its deposited metal 2, to the stripping apparatus 6 where it is guided into the device by means of guides 14 and reaction member 17. The cathode plate is positioned in frame 11 with its hanging bar portion cradled by upper support member 14 and lower portion held by lower support member 15. In this position, the cathode plate 1 and deposited metal 20 is held in a substantially vertical position with movement of the upper and lower edges of the cathode plate 1 being restricted by means of upper and lower support members 14, 15.

Preferably, when the cathode plate 1 is positioned in frame 11, the carriage 10 is at a lower position relative to members 14, 15. This position is shown in Figure 6.

The carriage 10 is then raised by lifting means 16 such that flexing means 20 are positioned intermediate upper and lower edges of the cathode plate. As shown in Figure 7,

preferably the carriage means is lifted to the uppermost portion of the cathode plate 1. Flexing means 20 are then engaged and brought into contact with the cathode plate 1 so that this plate is flexed in a plane perpendicular to the plane of the undeformed plate. Most preferably, and as discussed above, flexing means 20 is provided on opposing sides of the carriage plate and operated to reciprocally flex the cathode plate at a desired amplitude in a forward and backward direction relative to the plane of symmetry of the frame ie toward the left and right hand side of Figure 7.

This flexing operation causes the deposited metal 2 on the cathode plate 1 to loosen from the cathode plate such that a gap is opened at the top between the deposited metal 2 and the cathode plate 1. The carriage is then lowered by suitable operation of lifting means 16 so that knives 21 enter the gap so formed at the top of the plate to thereby strip the deposited metal 2 from the cathode plate 1. During lowering of the carriage 10 the cathode plate is still supported by upper and lower support members 14, 15. As shown more clearly in Figure 8, as the carriage is lowered, knives 21 continue to strip the deposited metal from both sides of the cathode plate, the stripped metal being allowed to fall on rollers or conveyor 22 from where it is fed to the cathode stack of deposited metal. The reusable stripped cathode plate 1 is then lifted by pivot arm hoist 5 (see Figure 1) and transferred to the discharge conveyor for reuse in the electrode deposition apparatus.

The present inventive apparatus is suitable for use with virtually any process which electrolytically deposits metal on a cathode plate. It will be appreciated by those skilled in the art that the stripping apparatus may be embodied in other forms without departing from the spirit or scope of the invention as claimed.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An apparatus for stripping electrolytically deposited metal from a cathode plate comprising:

a frame having upper and lower support members for supporting the cathode plate about upper and lower edge portions thereof;

a carriage member mounted for translation relative to the frame, the carriage member being provided with flexing means for flexing the cathode plate in a direction substantially perpendicular to the plane of the frame to thereby loosen the metal from the cathode plate;

means for raising and lowering the carriage member relative to the support members; and

means associated with the carriage for engaging the loosened metal to strip the metal from the plate when the carriage is lowered relative to the support members.

2. An apparatus as claimed in claim 1 wherein the carriage member comprises flexing means on opposing sides to flex the cathode plate in opposite directions.

3. An apparatus as claimed in claim 1 or claim 2 wherein the upper support member comprises at least two cradle members to support end edge portions of a hanging bar of the cathode plate.

4. An apparatus as claimed in any one of the previous claims wherein the carriage member comprises reaction members at upper and lower portions thereof to restrict flexure of the cathode plate to that portion of the plate extending from the lower reaction member to the upper reaction member.

5. An apparatus as claimed in any one of the preceding claims wherein the means for engaging the loosened metal comprise knives adapted to enter a gap between the loosened metal and cathode plate.

6. A method of stripping an electrolytically deposited metal from a cathode plate said method comprising the steps of:

substantially vertically positioning the cathode plate with deposited metal thereon and supporting said plate at upper and lower edge portions thereof;

flexing at least a portion of said cathode plate in a direction substantially perpendicular to the plane of undeflected plate while maintaining upper and lower edge portions of the plate in said plane, to thereby loosen the deposited metal from the plate; and

stripping the loosened metal from the plate.

7. A method as claimed in claim 6 wherein at least a portion of said cathode plate is flexed from opposing sides and in opposing directions substantially perpendicular to the plane of the undeflected plate.

8. A method as claimed in claim 7 wherein said cathode plate is reciprocally flexed in opposing directions perpendicular to the plane of the undeflected plate.

9. A method as claimed in claim 6, 7 or 8 wherein said flexing is limited to a region of the cathode plate.

10. A method as claimed in claim 8 wherein the upper region of the cathode plate is flexed.

11. A method as claimed in claim 6 or claim 7 wherein the cathode plate is flexed by applying a force, retracting the force, moving to a different area of the plate and applying a force at a different contact point on the plate spaced from the previous contact point.

12. An apparatus substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

13. A method substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

DATED this 14th day of September 1999

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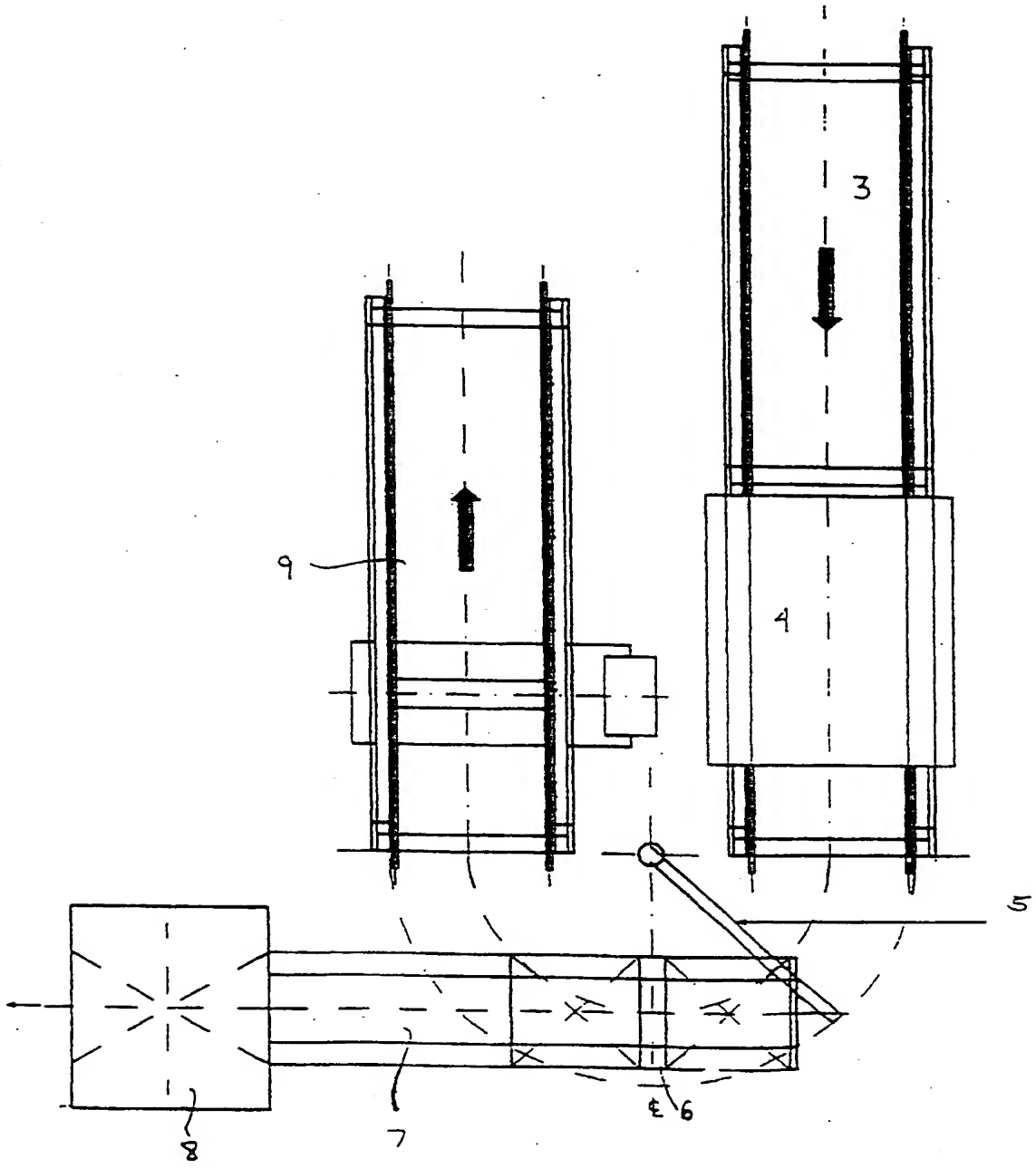

FIG 1

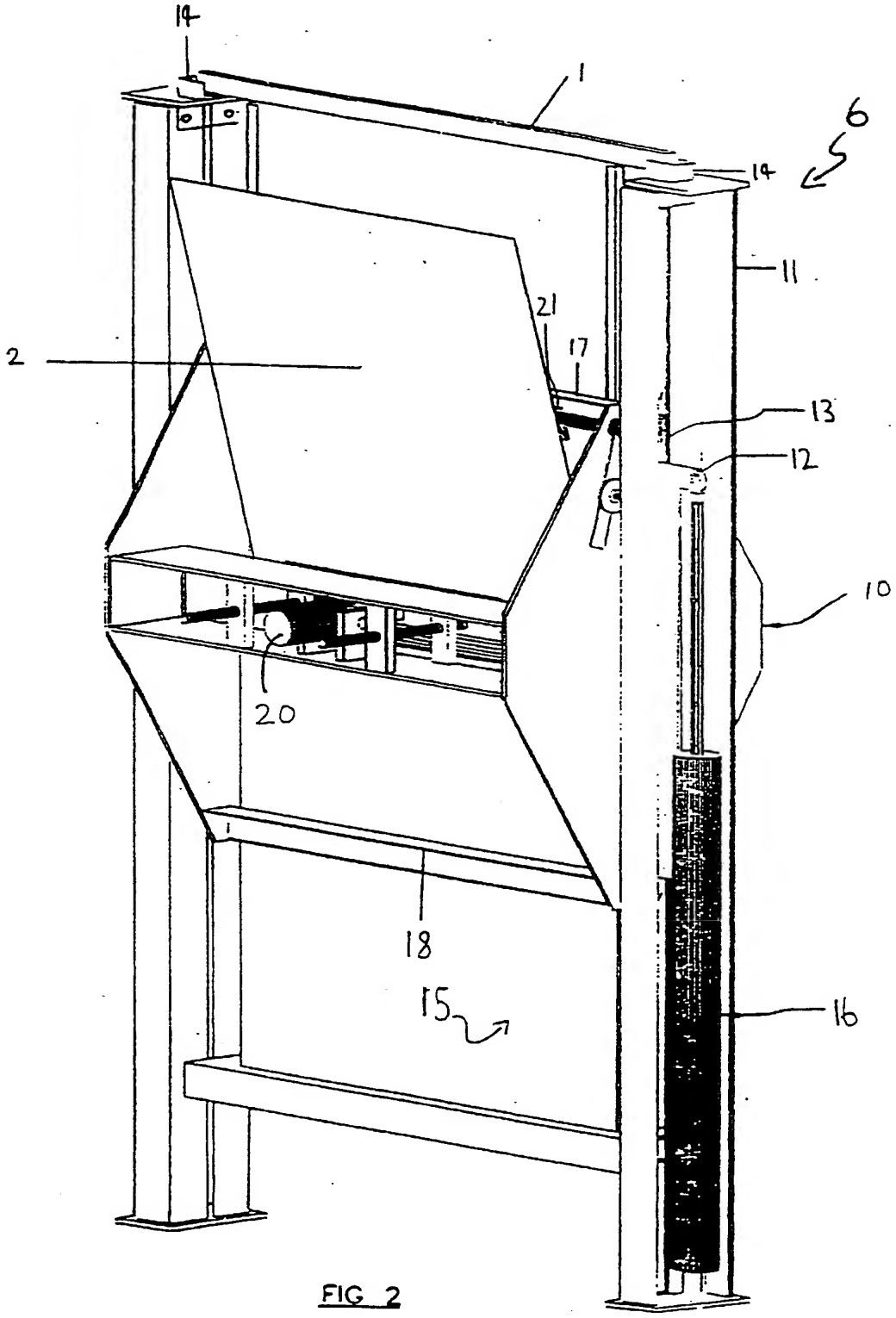

FIG 2

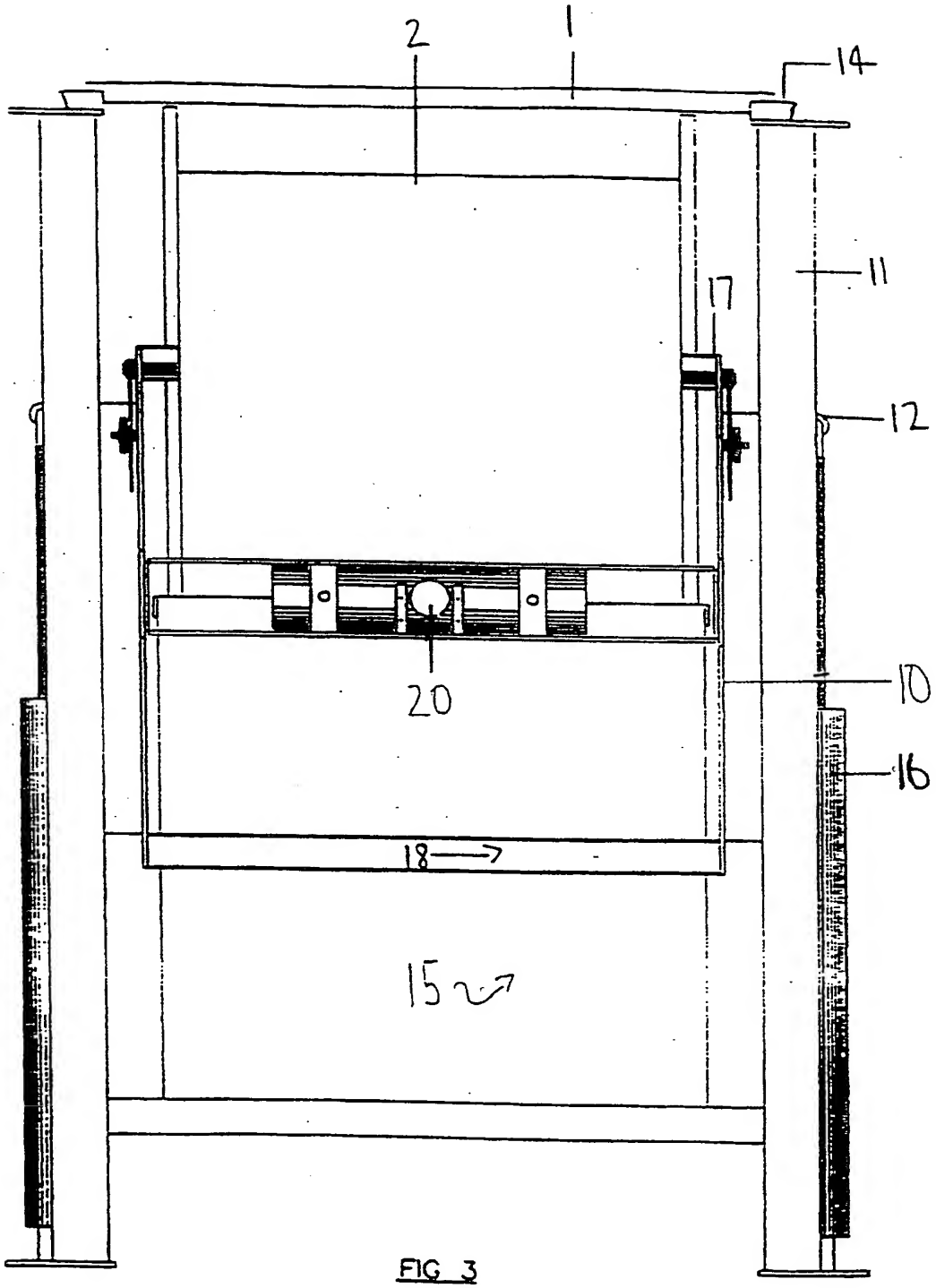

FIG 3

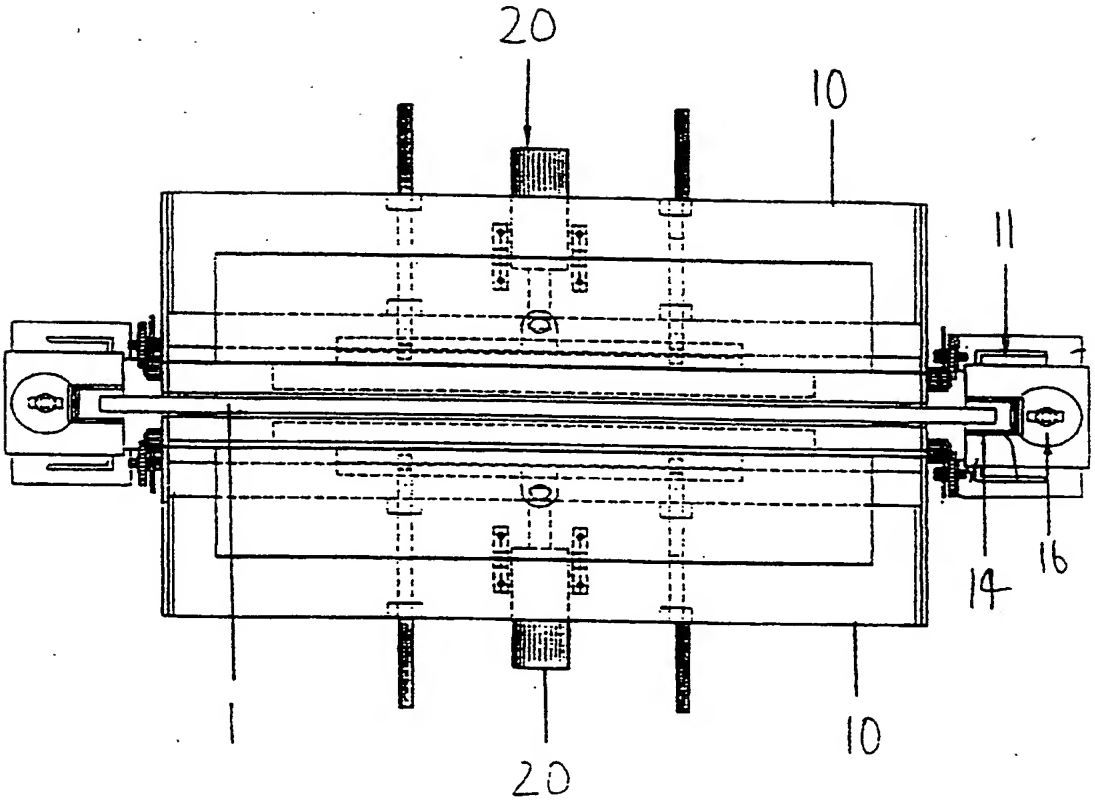

FIG 4

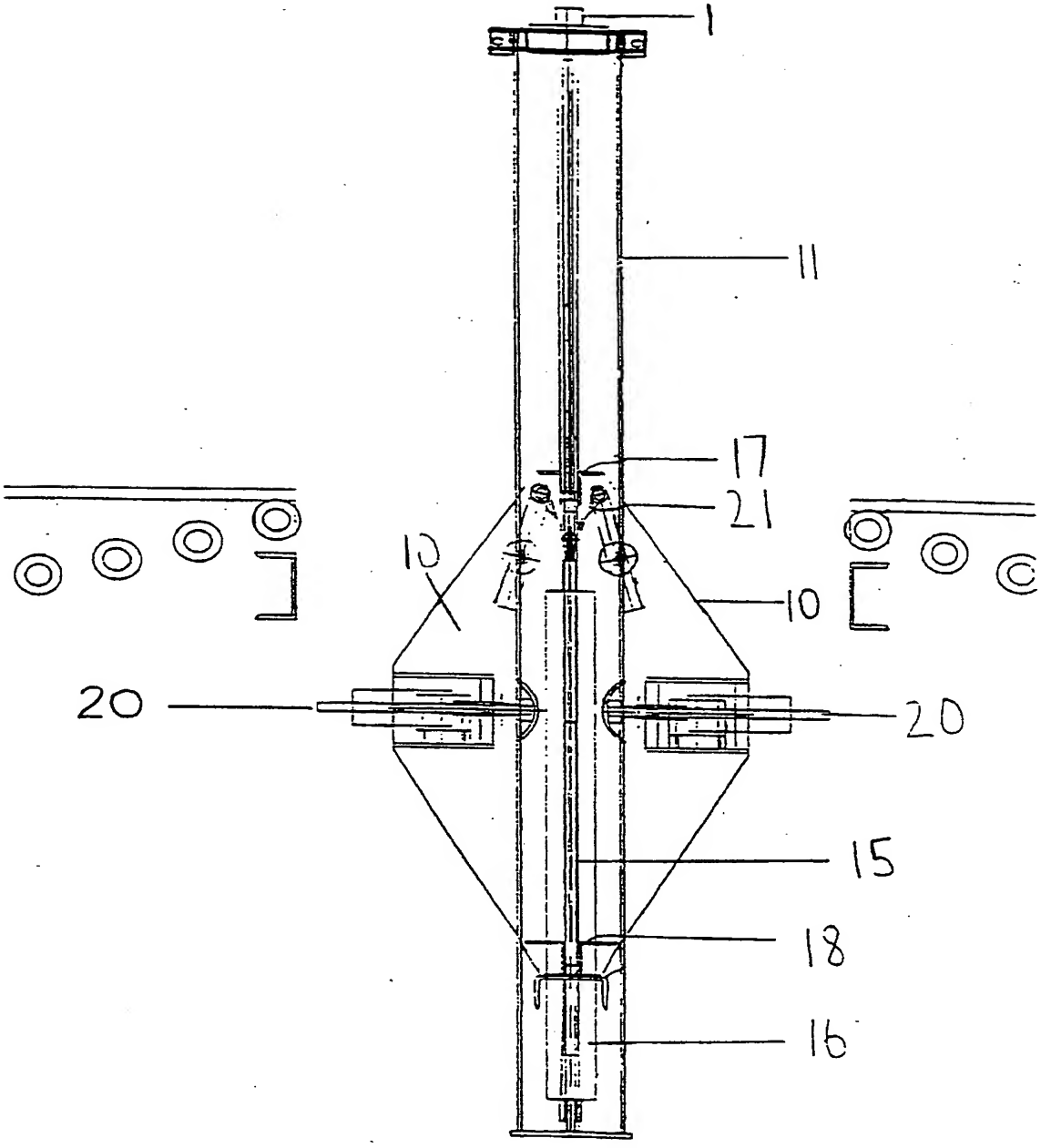

FIG. 5

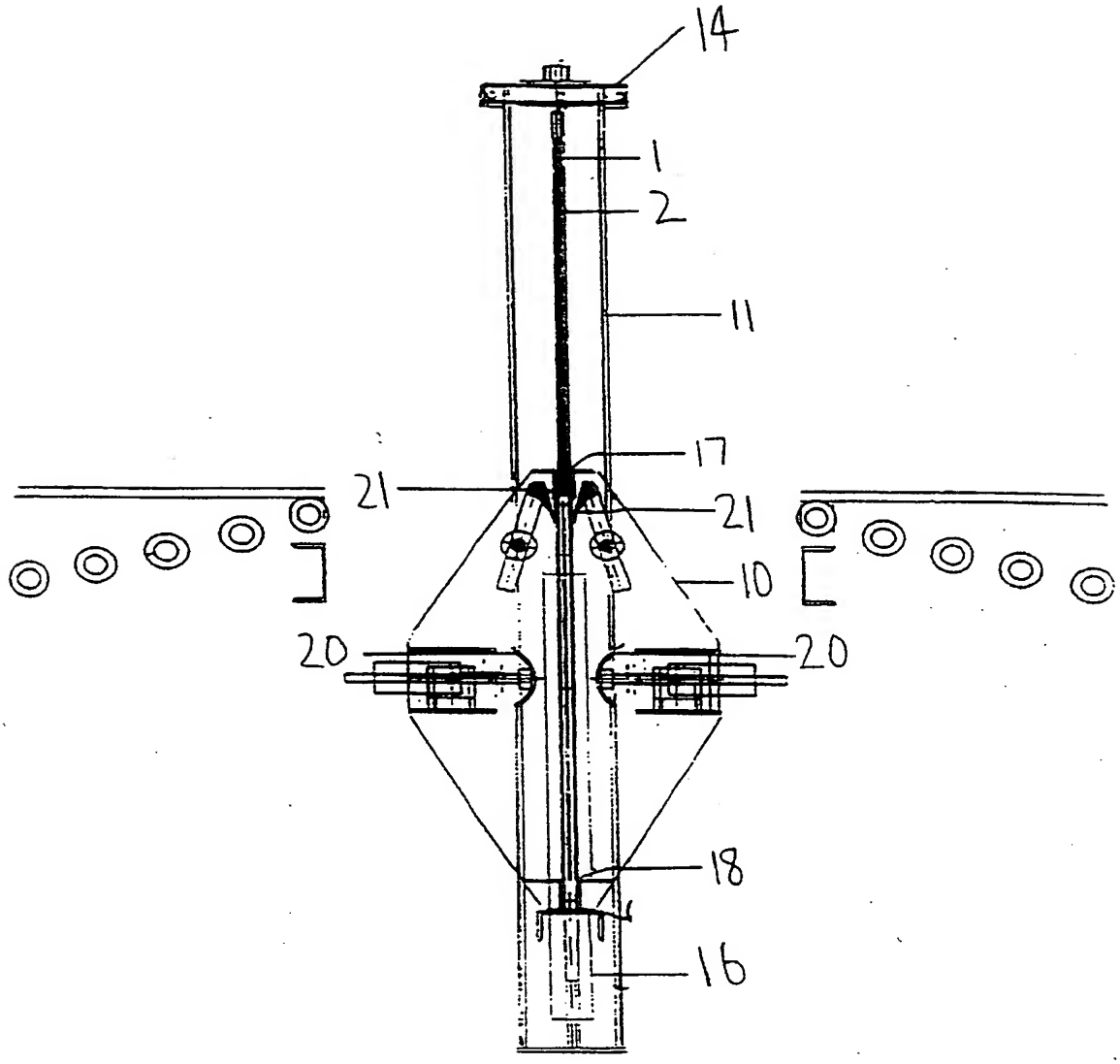

FIG. 6

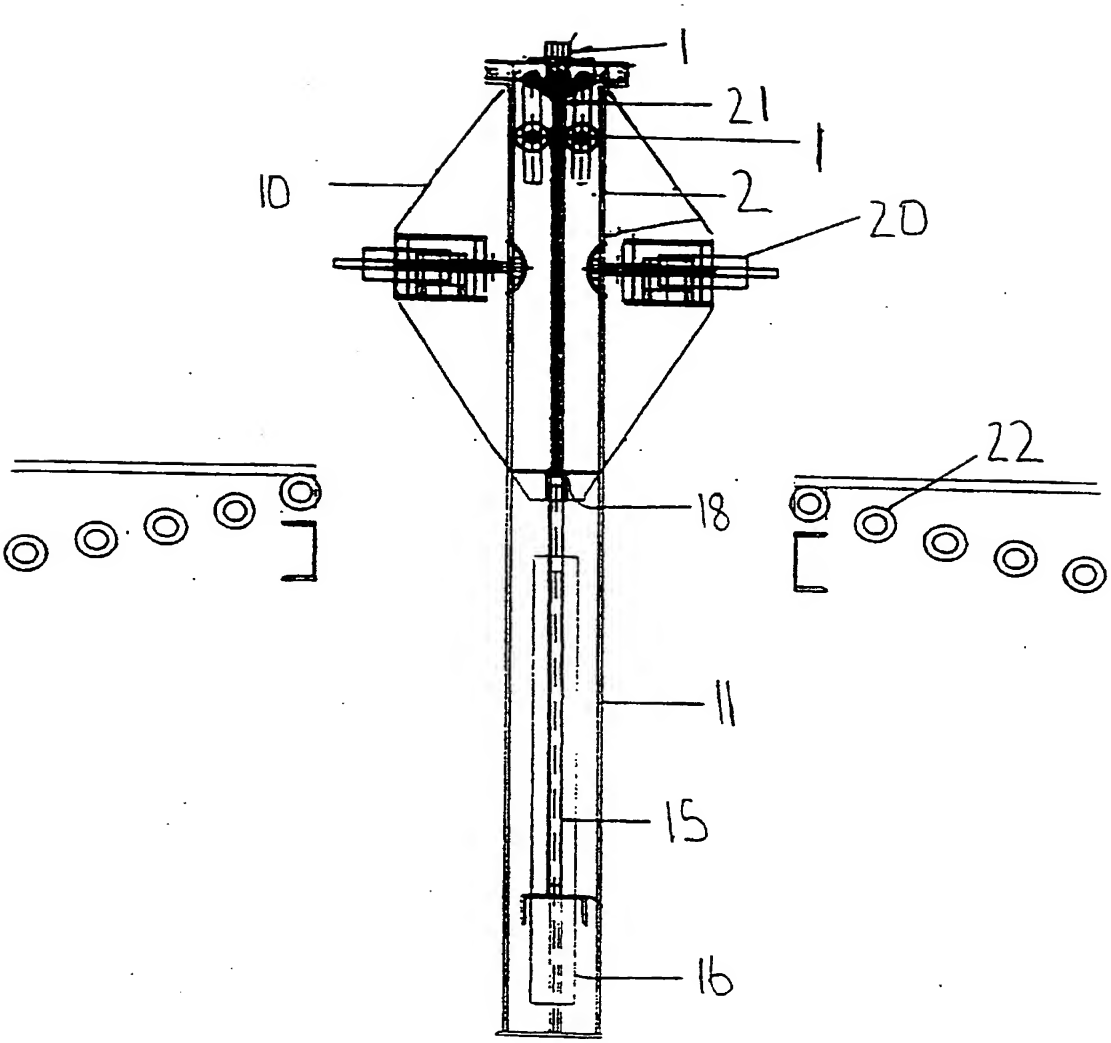

FIG. 7

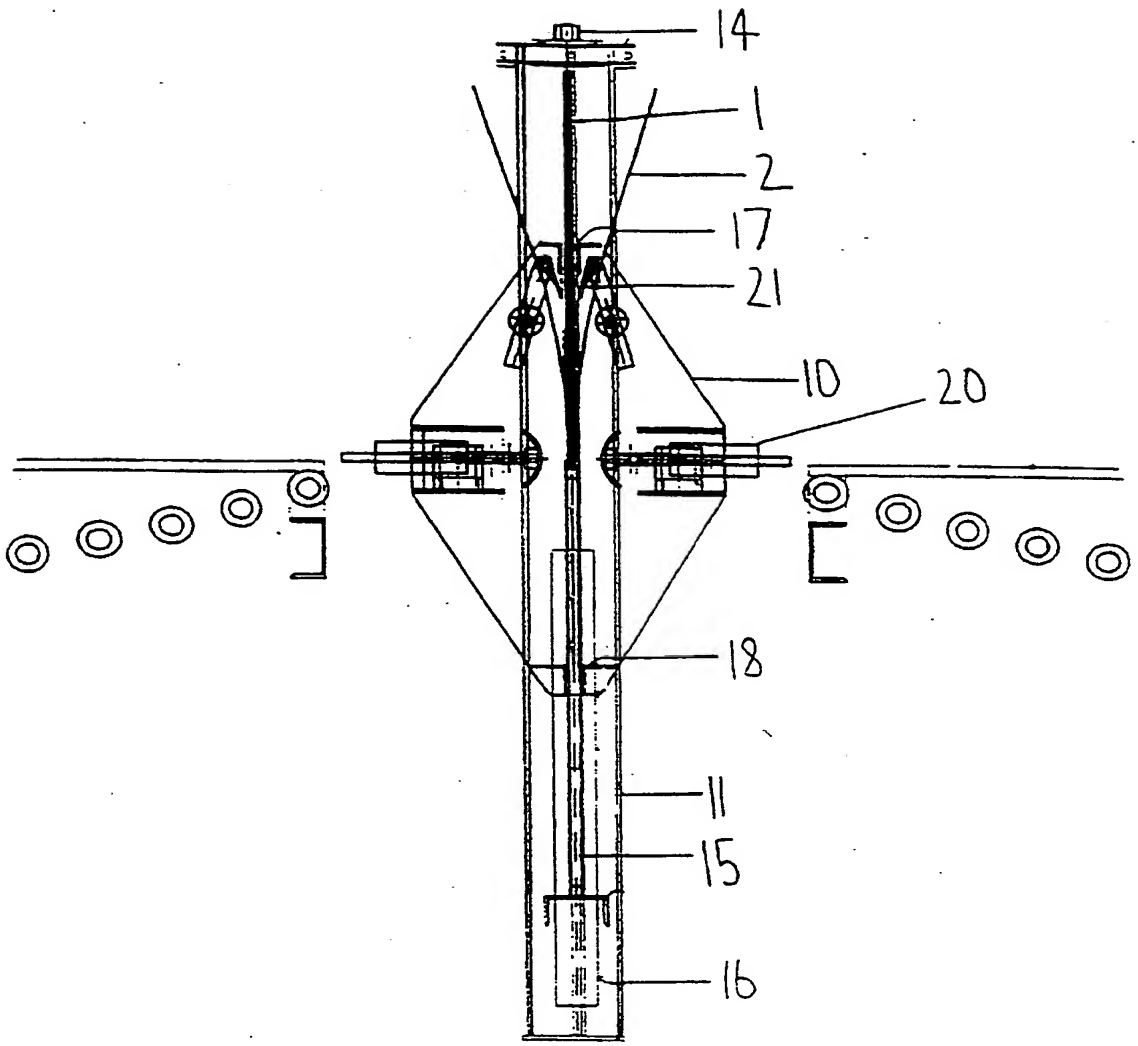

FIG. 8

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Title : An apparatus for stripping electrolytically deposited metal ....

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